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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,863	12/09/2003	Mason K. Harrup	B-214	8133
7590	11/28/2005		EXAMINER	
Stephen R. Christian BBWI PO BOX 1625 IDAHO FALLS, ID 83415-3899			POULOS, SANDRA K	
			ART UNIT	PAPER NUMBER
			1714	

DATE MAILED: 11/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/732,863	Applicant(s) HARRUP ET AL.	
	Examiner Sandra K. Poulos	Art Unit 1714	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 12/09/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. There are references submitted by the applicant that are not listed in information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office.

Specification

2. The abstract of the disclosure is objected to because it is unclear what the following means: "N:\2939\6018\B-214 pat app .doc". Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

Claims 49-59 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 49 recites the limitation "the inorganic oxide constituent." There is insufficient antecedent basis for this limitation in the claim.

Claims 50-59 are rejected under 35 U.S.C. 112, second paragraph, as being dependent upon a rejected base claim.

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It is to be noted that for the purposes of examination, the Examiner has assumed that "the inorganic oxide constituent" is the "inorganic constituent."

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of

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35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-3, 5, 7, 9-11, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55 and 57-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson et al (Synthesis, Characterization, and Ion Sequestration of Novel Nanocomposite Materials) in view of Novak et al (Simultaneous Interpenetrating Networks of Inorganic Glasses and Organic Polymers). Polson discloses nanocomposites which combine water-soluble polymers with ceramics. Ceramics are composed mainly of silicon dioxide (Hawley's Condensed Chemical Dictionary). The nanocomposite is considered for subsurface remediation through the formation of an *in-situ* permeable reactive barrier. The physical stabilization can be deliberately altered to adjust the properties of the composite to those required for subsurface applications. Animomolybdophosphate is used as a selective cesium capturing agent (metal ion sequestration constituent).

It is examiner's position that the permeable reactive barrier would be homogeneous and that the metal ion sequestration constituent would be uniformly distributed throughout the material because an asymmetrical barrier would not block the flow of contaminants to the extent that a homogeneous barrier would because it, in random parts, would be less selectively permeable to the cesium.

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It is examiner's position that because Polson discloses an *in-situ* permeable reactive barrier, the barrier would have been disposed in a flow path of water within the ground.

The difference between Polson and the presently claimed invention is that Polson is silent with respect to interpenetrating networks and does not disclose metal alkoxides or solvating the polymer.

Novak discloses dissolving SiO_2 and polymers to form interpenetrating networks. Furthermore, silicon alkoxides can be used to eliminate the problem of shrinkage in nanocomposites. It would have been obvious to one of ordinary skill in the art to form an interpenetrating network of dissolved polymer and SiO_2 or a silicon alkoxide in the composition given by Polson because doing so gives better phase homogeneity between two chemically dissimilar phases. Additionally it would have been obvious to use a metal alkoxide to eliminate shrinkage in the nanocomposite, thereby obtaining the invention as set forth in the presently cited claims.

6. Claims 4, 6, 8, 13-15, 19, 21, 30, 35, 37, 39, 54, 56, and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak as applied to claims 1-3, 5, 7, 9-11, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55 and 57-58 above, and further in view of Sebesta et al (Composite Ion Exchanger with Ammonium Molybdophosphate and its Properties).

Polson in view of Novak disclose the information in paragraph 5 above.

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The difference between Polson in view of Novak and the presently claimed invention is ammonium molybdophosphate was not disclosed, nor was polyacrylonitrile disclosed.

Sebesta teaches the use of a composite or membrane of an organic hydrophilic polymer, in particular, polyacrylonitrile (PAN), and ammonium molybdophosphate (AMP) for selectively capturing cesium for the purification of liquid wastes (pg 15, 16, 21). Sebesta discloses that AMP has a high selectivity of cesium sorption (pg 15).

It would have been obvious to one of ordinary skill in the art to substitute PAN for the polymer in Polson in view of Novak, and to add AMP rather than aminomolybdophosphate because Sebesta shows through experimental examples that the PAN-AMP combination is desirable for a quick, selective separation of cesium for liquid wastes (pg 15-21).

Hence, the invention as set forth in the presently cited claims is obtained.

7. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak further in view of Sebesta as applied to claims 1-11, 13-22, 30, 31-39, 49, 52-59 above, and further in view of Wen et al (Organic/Inorganic Hybrid Network Materials by the Sol-Gel Approach).

Polson in view of Novak further in view of Sebesta disclose the information given in paragraphs 5-6 above.

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The difference between Polson in view of Novak further in view of Sebesta and the presently claimed invention is that tetraethylorthosilicate (TEOS) is not disclosed.

Wen discloses a nanocomposite organic/inorganic hybrid network that can be used as an adsorbent, comprising of metal alkoxides and polymers in a solvent (pg 1667-1668). Specific polymer on disclosed in Table 2, pg 1670. Wen discloses that TEOS is less reactive than other metal alkoxides and therefore is better for forming networks (pg 1669).

It would have been obvious to one of ordinary skill in the art to substitute TEOS for metal alkoxide in Polson in view of Novak further in view of Sebesta, thereby obtaining the invention as set forth in the presently cited claim.

8. Claims 24-28, 44-48, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak further in view of Sebesta and Wen as applied to claims 1-22, 30-39, 49, 52-59 above, and further in view of EPA/600/R-98/125 (Permeable Reactive Barrier Technologies for Contaminant Remediation).

Polson in view of Novak further in view of Sebesta and Wen disclose the information in paragraphs 5-7 above. They do not disclose specially where the permeable reactive barrier is located.

EPA discloses the method of remediating groundwater through the use of a permeable reactive barrier (PRB) (pg 1). Figure 1 on page 1 shows how the PRB is used, and it is to be noted that Figure 1 is identical to Figure 6 of the

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current application, wherein it is disclosed that "Fig. 6 illustrates the use of the nanocomposite materials of the present invention to remediate contaminated groundwater." EPA discloses that PBRs are currently built with two basic configurations, the funnel-and-gate and the continuous PRB (pg 1). Both have required some degree of excavation and have been limited in depth (pg 1). Newer techniques for emplacing reactive media such as injection of slurries may serve to overcome some of the emplacement limitations (pg 1). The funnel and gate design uses impermeable walls to direct the plume flow to the PBR and has a greater impact on altering groundwater flow than does continuous PBR (pg 1). The type of continuous PBR most commonly installed is a trench that has been excavated (pg 36). The trench is in the saturated zone (pg 37). There can be supporting trenches also installed (pg 38-39). The PRBs disclosed by the EPA are iron metal PRBs (pg 1).

It is examiner's position that the disclosed impermeable walls are at an angle greater than zero degrees in relation to the membrane because at zero degrees the impermeable walls would not direct the plume flow to the PBR, as is the purpose for them, given in page 1.

It would have been obvious to one of ordinary skill in the art to use the PRB of Polson in view of Novak further in view of Sebesta and Wen in the configurations given by the EPA because the given configurations have been in use and have shown successful decontamination of groundwater. One would expect reasonable success because both are PRBs used for removing contaminants from groundwater.

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It would have been obvious to one of ordinary skill in the art to locate the PRB of Polson in view of Novak further in view of Sebesta and Wen in an excavated trench in the groundwater table because it is the most commonly installed continuous trench. Additionally, it would have been obvious to use supporting trenches for support.

It would have been obvious to one of ordinary skill in the art to also use a funnel and gate configuration because the impermeable walls would direct the plume flow to the PBR so that the water could be treated.

Hence, the invention as set forth in the presently cited claims is obtained.

9. Claims 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak further in view of Sebesta and Wen and EPA as applied to claims 1-22, 24-28, 30-39, 44-49, 51-59 above, and further in view of Conner et al (US 5,728,302).

Polson in view of Novak further in view of Sebesta and Wen and EPA disclose the information given in paragraphs 5-8 above. They do not disclose injecting a slurry of the nanocomposite dispersed in a liquid.

Conner discloses a method of reducing the concentration of radioactive contaminants in fluids from subterranean reservoirs by directly introducing a solid sorbant into the reservoir as a solid component of a solid-liquid slurry using high pressure injection techniques (abstract; col 2, lines 39-67). The resin is mixed with an appropriate injection fluid and subsequently introduced into the reservoir (col 3, lines 28-35). The injection fluid is most commonly water (col 7, lines 14-

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22). Solid sorbants such as oxides of zirconium and titanium may be employed for removal of dissolved radionuclides (col 5, lines 27-35).

It would have been obvious to one of ordinary skill in the art to use the nanocomposite of Polson in view of Novak further in view of Sebesta and Wen and EPA and inject it into the ground as disclosed by Conner because both are used in remediation of groundwater. One would expect reasonable success because both compositions comprise a resin and oxide and remove contaminants from groundwater, thereby obtaining the invention as set forth in the presently cited claims.

10. Claims 23, 40, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak further in view of Sebesta, Wen, EPA, and Conner as applied to claims 1-22, 24-28, 30-39, 41-49, 51-59 above, and further in view of Gilmore et al (US PG PUB 2001/0033772 A1).

Polson in view of Novak further in view of Sebesta, Wen, EPA, and Conner disclose the information given in paragraphs 5-9 above. They do not disclose use of a PBR or the nanocomposite in the vadose zone.

Gilmore discloses a reactive barrier for control of contaminated soil and groundwater (pg 1). A reactive barrier used to alleviate the spreading of groundwater contamination and vadose zone contamination (pg 1, paragraph 9-10). The contaminants that treated are metals, organics, and radionuclides (pg 2, paragraph 23). Gilmore discloses that there has also been some success in using reactive barriers in trenches (pg 1, paragraph 8).

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It would have been obvious to one of ordinary skill in the art to use PBR of Polson in view of Novak further in view of Sebesta, Wen, EPA, and Conner and apply it to the vadose zone as disclosed by Gilmore because both are used in remediation of groundwater. One would expect reasonable success in using the PBR in the vadose zone because Gilmore discloses that reactive barriers can be used both in the vadose zone and in the groundwater, which would motivate one of ordinary skill to use a PBR in the vadose zone when it had only been used in the water table, thereby obtaining the invention as set forth in the presently cited claims.

11. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak further in view of Sebesta, Wen, EPA, Conner, and Gilmore as applied to claims 1-28, 30-59 above, and further in view of Cantrell et al (US 5,857,810).

Polson in view of Novak further in view of Sebesta, Wen, EPA, Conner, and Gilmore disclose the information given in paragraphs 5-10 above. They do not disclose the hydraulic conductivity of the membrane.

Cantrell discloses a chemical barrier injected into the groundwater as a suspension of solid particles or colloids in order to react with a contaminant plume (abstract; col 2). In column 4, Cantrell discloses that the hydraulic conductivity of a particular aquifer material is a linear function of the viscosity of the fluid passing through it. It is preferred that the hydraulic conductivity be substantially the same as the water alone (col 4).

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It would have been obvious to one of ordinary skill in the art to use PBR of Polson in view of Novak further in view of Sebesta, Wen, EPA, Conner, and Gilmore and require a hydraulic conductivity as disclosed by Cantrelle because both are used in remediation of groundwater. One would be motivated to do so because it enhances the ability of the porous media to remove contaminants. One would expect reasonable success in combining the references because the objective in both are to remove contaminants from groundwater via a barrier or membrane.

Hence, the invention as set forth in the presently cited claims is obtained.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

-Onodera, Yoshio. A New Granular Composite with High Selectivity for Cesium Ion Prepared from Phosphomolybdic Acid Hydrate and Inorganic Porous Material. Separation Science and Technology. 1999. Vol. 34, No. 12. pg 2347-2354. (Discloses ammonium molybdophosphate incorporated into an alumina matrix.)

-Gaur, Sushma. Determination of Cs-137 in environmental water by ion-exchange chromatography. Journal of Chromatography A. Vol. 773, Issues 1-2, pg 57-71, May 1996. (Discloses removal of Cs-137 in environmental waters by ion-exchange.)

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13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sandra K. Poulos whose telephone number is (571) 272-6428. The examiner can normally be reached on M-F 7:30-5:00, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (571) 272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SKP

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11/22/05

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